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# 1 [Java bytecode compression for low-end embedded systems](#)

Lars Ræder Clausen, Ulrik Pagh Schultz, Charles Consel, Gilles Muller

May 2000 **ACM Transactions on Programming Languages and Systems (TOPL)**  
 Volume 22 Issue 3

Full text available: [pdf\(241.04 KB\)](#)

Additional Information: [full citation](#), [abstract](#), [reference](#),  
[index terms](#), [review](#)

A program executing on a low-end embedded system, such as a smart-card, faces : memory resources and fixed execution time constraints. We demonstrate that factoring common instruction sequences in Java bytecode allows the memory footprint to be average, to 85% of its original size, with a minimal execution time penalty. While preserving Java compatibility, our solution requires only a few modifications which are straightforward to implement in any JVM used in a low-end ...

**Keywords:** Java bytecode, code compression, embedded systems

# 2 [FACADE: a typed intermediate language dedicated to smart cards](#)

Gilles Grimaud, Jean-Louis Lanet, Jean-Jacques Vandewalle

October 1999 **ACM SIGSOFT Software Engineering Notes , Proceedings of the European engineering conference held jointly with the 7th ACM international symposium on Foundations of software engineering**  
 24 Issue 6

Full text available: [pdf\(1.23 MB\)](#)


Additional Information: [full citation](#), [abstract](#), [reference](#),  
[index terms](#)

The use of smart cards to run software modules on demand has become a major business concern for application issuers. Such downloadable executable content needs to be adapted to the card execution environment in order to ensure that an instruction on a memory is compliant with the definition of the data stored in this area (i.e. its type). Current smart cards rely on three techniques. For Java Card, either an off-card verifier-converter performs a static ...

3

Computer security (SEC): Java bytecode verification on Java cards


Roberto Barbuti, Stefano Cataudella

**March 2004 Proceedings of the 2004 ACM symposium on Applied computing**Full text available:  [pdf\(236.57 KB\)](#) Additional Information: [full citation](#), [abstract](#), [reference terms](#)

A Java program is usually translated into an intermediate language, known as Java Machine Language (JVML), which is then executed by a Java Virtual Machine (JVM). execution a JVML program is verified to prevent a wide range of run-time errors. No Java applets are available for various kinds of portable devices, including modern Java cards. However, Java cards cannot execute the classical verification algorithms, due to a very small amount of working memory. We ...

**Keywords:** Java bytecode, Java card, abstract interpretation**4** A java virtual machine architecture for very small devices

Nik Shaylor, Douglas N. Simon, William R. Bush

**June 2003 ACM SIGPLAN Notices , Proceedings of the 2003 ACM SIGPLAN conference on Language, compiler, and tool for embedded systems, Volume 38**Full text available:  [pdf\(182.85 KB\)](#) Additional Information: [full citation](#), [abstract](#), [reference terms](#)

The smallest complete Java™ virtual machine implementations in use today are based on the CLDC standard and are deployed in mobile phones and PDAs. These implementations are several tens of kilobytes. Smaller Java-like implementations also exist, but these involve compromises in Java semantics. This paper describes a JVM™ architecture designed for small devices. It supports all the CLDC Java platform semantics, including exact garbage collection, dynamic class loading, and v ...

**Keywords:** CLDC, JVM, java, limited-memory devices, next generation smart cards**5** Smart card: Is the performance of smart card cryptographic functions the real issue?

Konstantinos Markantonakis

**June 2001 Proceedings of the 16th international conference on Information security and Trusted information: the new decade challenge**Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

It is generally believed that among the major delaying factors of smart card performance are the speed of the cryptographic algorithms. This is only partially true, as a number of other factors that add substantial delays to the overall performance of a smart card application must also be taken into account. In this paper we analyse the significance of these delaying factors. Furthermore, we also present some performance measurements of the two most widely used smart card terminal application programming interfaces ...

**Keywords:** Java cards, cryptographic algorithms, multi-application, performance measurements, smart cards, terminal APIs

## 6 Proceedings - only: New channels, old concerns: scalable and reliable data dissemination

Colin Allison, Duncan McPherson, Dirk Husemann

September 2000 **Proceedings of the 9th workshop on ACM SIGOPS European beyond the PC: new challenges for the operating system**


Full text available:  pdf(76.39 KB) Additional Information: [full citation](#), [abstract](#), [reference](#)

An interesting trend in the continuing convergence of information technologies is the emergence of the Internet as a content provider in its own right, as opposed to its being one of many delivery channels. For example, it is increasingly the primary source for such as court rulings and software releases. Unfortunately the IP protocols normally used for reliable data transfer are of the point-to-point type and not well suited to large-scale-to-many dissemination. Sudden rush ...

## 7 Proactive secure message transmission in asynchronous networks

Michael Backes, Christian Cachin, Reto Stroh

July 2003 **Proceedings of the twenty-second annual symposium on Principles of distributed computing**

Full text available:  pdf(1.07 MB) Additional Information: [full citation](#), [abstract](#), [reference terms](#)

We study the problem of secure message transmission among a group of parties in an asynchronous network, where an adversary may repeatedly break into some parties during transient periods of time. A solution for this task is needed in order to use proactive cryptosystems in wide-area networks with loose synchronization. Parties have access to a secure hardware device that stores some cryptographic keys, but can carry out only a limited set of operations. We provide a formal model of the problem ...

**Keywords:** proactive security, secure communication

## 8 Maté: a tiny virtual machine for sensor networks

Philip Levis, David Culler

October 2002 **Tenth international conference on architectural support for programming languages and operating systems on Proceedings of the 10th international conference on architectural support for programming languages and operating systems (ASPLOS-X)**, Volume 37 , 30 , 35 , 5


Full text available:  pdf(1.22 MB) Additional Information: [full citation](#), [abstract](#), [reference](#)

Composed of tens of thousands of tiny devices with very limited resources ("motes") sensor networks are subject to novel systems problems and constraints. The large number of nodes in a sensor network means that there will often be some failing nodes; networks must be able to repopulate. Often there is no feasible method to recharge motes, so energy is a precious resource. Once deployed, a network must be reprogrammable although physically difficult and this reprogramming can be a significant ...

## 9 Executable JVM model for analytical reasoning: a study

Hanbing Liu, J Strother Moore

June 2003 **Proceedings of the 2003 workshop on Interpreters, Virtual Machir Emulators**


Full text available:  pdf(230.18 KB) Additional Information: [full citation](#), [abstract](#), [reference terms](#)

To study the properties of the Java Virtual Machine(JVM) and Java programs, our re group has produced a series of JVM models written in a functional subset of Commc this paper, we present our most complete JVM model from this series, namely, M6, derived from a careful study of the J2ME KVM [16] implementation. On the one hand model is a conventional machine emulator. M6 models accurately almost all aspects implementation, including the dynamic class lo ...

# 10 [Formalizing the safety of Java, the Java virtual machine, and Java card](#)

Pieter H. Hartel, Luc Moreau

December 2001 **ACM Computing Surveys (CSUR)**, Volume 33 Issue 4


Full text available:  pdf(442.86 KB) Additional Information: [full citation](#), [abstract](#), [reference index terms](#)

We review the existing literature on Java safety, emphasizing formal approaches, a impact of Java safety on small footprint devices such as smartcards. The conclusion although a lot of good work has been done, a more concerted effort is needed to bu coherent set of machine-readable formal models of the whole of Java and its imple This is a formidable task but we believe it is essential to build trust in Java safety, a to achieve ITSEC level 6 or Common Crite ...

**Keywords:** Common criteria, programming

# 11 [Compiling java for low-end embedded systems](#)

Ulrik Pagh Schultz, Kim Burggaard, Flemming Gram Christensen, Jørgen Lindskov Knud June 2003 **ACM SIGPLAN Notices , Proceedings of the 2003 ACM SIGPLAN coi on Language, compiler, and tool for embedded systems**, Volume 38


Full text available:  pdf(267.00 KB) Additional Information: [full citation](#), [abstract](#), [reference terms](#)

The production of embedded systems is continuously increasing, but developing reu software for such systems is notoriously difficult, in particular in the case of low-enc systems based on 16-bit or 8-bit processors. We have developed a compilation syst executing Java byte code on low-end embedded systems, and we demonstrate how permits object-oriented programming techniques to be used on devices with only a hundred bytes of RAM and a few kilobytes of ROM. We an ...

**Keywords:** Java, compilers, embedded systems, interfaces

# 12 [Web technologies and applications \(WTA\): Cookies on-the-move: managing c smart card](#)


Alvin T. S. Chan

**March 2004 Proceedings of the 2004 ACM symposium on Applied computing**Full text available:  [pdf\(335.19 KB\)](#)Additional Information: [full citation](#), [abstract](#), [reference](#)

Despite the widespread use and adoption of cookies as the basis for web application state information, cookies present some design issues that are yet to be fully addressed. The fact that cookies are stored on client-side's memory means that they are tightly coupled to the machine that is interacting with the web server. Yet often, these cookies are initiated by web applications to identify user's preferences and identifications. As the user moves across different machines to access the ...

**Keywords:** Web, cookies, mobile, smart card**13 Session S4.2: program transformation: Leakage-proof program partitioning**

Tao Zhang, Santosh Pande, Andre dos Santos, Franz Josef Bruecklmayr

**October 2002 Proceedings of the international conference on Compilers, architecture and synthesis for embedded systems**Full text available:  [pdf\(231.35 KB\)](#)Additional Information: [full citation](#), [abstract](#), [reference](#), [index terms](#)

Due to limited available memory (of the order of Kilobytes) on embedded devices (e.g., smart cards), we undertake an approach of partitioning a whole program. The program is partitioned into small code blocks that are downloaded from the server on demand into the embedded device for execution. We devise a novel method of partitioning the code and data of the program such that no information regarding the control flow and behavior of the program is leaked. In other words, by observing the program partitions that ...

**Keywords:** mobile code, multi-application smart card, program partitioning, tamper resistance**14 JML (poster session): notations and tools supporting detailed design in Java**

Gary T. Leavens, Clyde Ruby, K. Rustan, M. Leino, Erik Poll, Bart Jacobs



**January 2000 Addendum to the 2000 proceedings of the conference on Object-oriented programming, systems, languages, and applications (Addendum)**Full text available:  [pdf\(70.62 KB\)](#)Additional Information: [full citation](#), [abstract](#), [reference](#), [index terms](#)

JML is a notation for specifying the detailed design of Java classes and interfaces. JML assertions are stated using a slight extension of Java's expression syntax. This should be easy to use. Tools for JML aid in static analysis, verification, and run-time debugging of code.


**Keywords:** ESC/Java, JML language, Java language, LOOP, behavioral interface specification language, detailed design notation

**15** A web-enabled framework for smart card applications in health services

Alvin T. S. Chan, Jiannong Cao, Henry Chan, Gilbert Young

September 2001 **Communications of the ACM**, Volume 44 Issue 9Full text available:  pdf(208.56 KB)  html (29.84 KB)Additional Information: [full citation](#), [references](#), [citations](#), [terms](#)**16** Computer applications in health care: Integrating smart card access to Web-based medical information systems


Alvin T. S. Chan

March 2003 **Proceedings of the 2003 ACM symposium on Applied computing**Full text available:  pdf(504.51 KB)Additional Information: [full citation](#), [abstract](#), [reference](#), [terms](#)

This paper examines the application of smart cards in the development of distributed information systems. The pocket mobility and security features of smart cards make an ideal medium for storing the critical medical records of individual. However, the lack of interoperability and support for distributed operation has limited the development of smart cards in a networked environment. This paper highlights the benefits of combining World Wide Web and smart card technology ...

**Keywords:** Web, health care, mobile, smart card**17** P6: Document-based inter-organizational information exchange

Reinhard Riedl

October 2001 **Proceedings of the 19th annual international conference on Cooperative documentation**Full text available:  pdf(217.62 KB)Additional Information: [full citation](#), [abstract](#), [reference](#), [terms](#)


In this paper, we present our research work on document services for interstate e-government carried out in the FASME project. First, we depict the background for our research and describe its basic challenges. Then we discuss the required services out of the perspective of inter-organizational document services and documentation issues. From the evaluation of a prototypical implementation with user groups, we may conclude that interstate e-government services are feasible and that life with ...

**Keywords:** e-government, inter-organizational work-flows**18** A formal framework for the Java bytecode language and verifier

Stephen N. Freund, John C. Mitchell

October 1999 **ACM SIGPLAN Notices , Proceedings of the 14th ACM SIGPLAN conference on Object-oriented programming, systems, languages, and applications**

Volume 34 Issue 10

Full text available:  [pdf\(1.93 MB\)](#) Additional Information: [full citation](#), [abstract](#), [reference](#), [index terms](#)

This paper presents a sound type system for a large subset of the Java bytecode language including classes, interfaces, constructors, methods, exceptions, and bytecode subroutines. This work serves as the foundation for developing a formal specification of the bytecode language and the Java Virtual Machine's bytecode verifier. We also describe a prototype implementation of a type checker for our system and discuss some of the other applications of this work. For example, we show how to extend the system to support the Java Card API.

## 19 [Upfront](#)

Linux Journal Staff

December 2002 **Linux Journal**, Volume 2002 Issue 104

Full text available:  [html\(11.49 KB\)](#) Additional Information: [full citation](#), [index terms](#)

## 20 [Muscle Flexes Smart Cards into Linux](#)

David Corcoran

August 1998 **Linux Journal**

Full text available:  [html\(16.89 KB\)](#) Additional Information: [full citation](#), [abstract](#), [index terms](#)

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